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EDITORIAL COMMENTARY

The Contributions of Daniel Kahneman and Amos Tversky

The Royal Swedish Academy of Science awarded the 2002 Nobel Prize in Economics to Daniel Kahneman "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty." Kahneman shares the prize with Vernon Smith.[1] Kahneman did much of his Nobel Prize winning work with Amos Tversky, a fellow psychologist, starting when both were at the Hebrew University of Jerusalem. Tversky was not eligible for the Nobel Prize since its rules prohibit posthumous awards. He was 59 when he died in 1996.

The concepts of risk and return lie at the heart of finance; Kahneman and Tversky's work provides fundamental insights into the psychology associated with both. Their work is composed of two strands, prospect theory, and heuristics and biases. Prospect theory describes how people make decisions when facing risky (or risk-free) alternatives, while heuristics and biases describe, among other things, how people assess risk. Prospect theory provides the major psychological underpinnings for the behavioral approaches to portfolio selection, while heuristics and biases provide the major psychological underpinnings for the behavioral approach to asset pricing. We describe each strand and its applications to finance.

Prospect Theory and Portfolio Construction

Prospect theory, developed by Kahneman and Tversky [1979] and published in *Econometrica*, was singled out for praise by the Royal Swedish Academy of Science. Prospect theory is an alternative to mean-variance theory, the theory that underlies modern portfolio theory [Markowitz, 1959]. Prospect theory, like its mean-variance theory counterpart, focuses on the way people choose among alternatives. But the theories are different. People who conform to prospect theory tend to violate the principles that underlie mean-variance theory.

Several features distinguish prospect theory from mean-variance theory. First, people in mean-variance theory choose among alternatives based on the effect of the outcomes on the *levels* of their wealth. In contrast, people in prospect theory choose based on the effect of outcomes on *changes* in their wealth, relative to their reference point.

Second, people in mean-variance theory are risk averse in all of their choices. In contrast, people in prospect theory are generally risk averse when all changes in wealth are perceived as gains, but they are risk seeking when all changes in wealth are perceived as losses. Moreover, people in prospect theory perceive losses more severely than they perceive gains of equal amounts. Kahneman and Tversky use the term "loss aversion" to describe this asymmetry between the perception of gains and losses.

Third, people in mean-variance theory treat risk objectively, by its probabilities. In contrast, people in prospect theory overweight small probabilities. Overweighting may lead people to be risk-seeking in the domain of gains (ex. purchasing lottery tickets), and it may lead people to be risk-averse in the domain of losses (ex. purchasing insurance against outcomes with small probabilities).

Fourth, mean-variance theory implicitly assumes that the framing of alternatives does not affect choice. In contrast, prospect theory emphasizes that frames affect choices.

Kahneman and Tversky have influenced financial economists through many experiments. Consider an experiment that illuminates the features of prospect theory. Imagine that you face a concurrent choice within two pairs (A vs. B and C vs. D), where:

A = a sure gain of $24,000
B = a 25% chance to gain $100,000 and a 75% chance to gain nothing.
C = a sure loss of $75,000
D = 75% chance to lose $100,000 and 25% chance to lose nothing.

Kahneman and Tversky found that more people chose A than B and more people chose D than C. This common choice is a puzzle within standard finance, since mean-variance theory, the mainstay of standard finance, assumes that investors are always risk-averse, never risk-seeking. While the choice of A over B is consistent with risk aversion, the choice of D over C is

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